NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE GENERAL SPECIFICATION

TREE/SHRUB ESTABLISHMENT
(acre)
CODE 612

GENERAL SPECIFICATIONS

Procedures, technical details, and other information listed below provide additional guidance for carrying out selected components of the named practice. This material is referenced from the conservation practice standard for the named practice and supplements the requirements and considerations listed therein.

The mechanical tree planting components of this practice may adversely impact significant cultural resources and should be submitted to a cultural resource specialist for a determination of impacts before the practice commences.

PLANTING MATERIALS

Tree and shrub establishment may be accomplished through planting seedlings, cuttings, and seeds or through natural regeneration techniques.

Seedlings. Care must be taken that the seedlings come from a local seed source. Seedlings grown by the Arkansas Forestry Commission and forest industry nurseries using local seeds are acceptable. Seedlings obtained through other sources such as commercial nurseries must be grown from seed gathered within a 150-mile north-south direction from the planting site.

Only healthy, high-quality seedlings should be planted.

General standards for pine seedlings include:

- a minimum root collar of 1/8 inch diameter.
- a minimum height of 6-1/2 inches above the root collar.
- a minimum root length of 5 inches below the root collar.
- at least 5 first order lateral roots.

Hardwood seedlings should meet the following size requirements:

- a minimum root collar diameter of 1/4 inch.
- A minimum height of 16 inches above the root collar.
- A minimum root length of 8 inches below the root collar.
- At least 5 first order lateral roots.
- Lateral roots will not be pruned unless they exceed 8 inches in length. The pruned length will be 8 inches.
- Pecan seedlings may be smaller: 12 inches in height with a root length of 7 inches.

Shrub sizes will vary by species. Ideally, a root to shoot ratio of 1:2 should be maintained.

Species planted will be adapted to the soil-site conditions. Drainage adaptation is especially important as well as soil pH. See Figure 1 for a listing of pH requirements for the various tree species.

Tree and shrub spacings will be as follows:

SIZE AT 20 YEARS	SPACING
Trees > 20 ft. in height	8-12 ft.
Shrubs 10-20 ft. in height	5-8 ft.
Shrubs < 10 ft. in height	3-6 ft.

Final planting densities will vary from 545 to 681 pine trees per acre and 302 to 436 hardwood trees per acre. Shrub densities are highly variable and will be planned to meet landowner objectives.

Spacings for timber production will result in a higher density per acre than that for other

objectives of tree establishment. Wider spacings are generally better for wildlife habitat management.

Site preparation shall be sufficient for establishment and growth of the selected species. The type and intensity of site preparation will vary according to ground cover, soils, and the species to be planted (See Forest Site Preparation, Code 490). Areas with plow pans or compacted soils will be subsoiled.

Protect planting stock from desiccation and freezing during temporary storage and delivery to the planting site. Keep all types of planting stock, except those needed immediately for a supply during the planting operation, stored in a cool environment (preferably < 50 degrees F) out of direct sunlight and wind. Bag or box temperatures will not exceed 50 degrees F.

If planting will be delayed for more than 5 days, keep seedlings in shipping container and place in cold storage (35-45 degrees F). If cold storage is not feasible or available, seedlings should be heeled-in.

Container grown stock will be kept in its container and its soil kept moist. Thoroughly water plants two days before planting. This will facilitate removal from containers during planting.

Balled-and-burlapped plants will be kept moist by watering slowly from the top. Wet the foliage occasionally. Balled planting stock can be stored temporarily by placing soil or mulch around the entire ball and keeping it moist.

Bareroot seedlings will be planted from December 1 to March 31. Containerized trees may be planted from October through April. Trees planted late in the planting season are at a greater risk for mortality unless the site is wet.

Trees and shrubs may be planted by either mechanical or hand planting. Method used will accommodate local site and soil conditions.

Figure 2 illustrates the proper planting technique for hand planting with a planting bar.

On sloping land, planting by machine will be done on the contour whenever possible.

Planting will be done when the soil is neither too dry nor too wet. Planting will be avoided during freezing weather and when the ground is frozen. Avoid planting on hot (>70 degrees F) and/or windy days.

Plant each seedling (hardwood or pine) slightly deeper (1-2 inches) than it grew in the nursery in all soils except deep sands. In deep sands, trees will be planted deeper.

Planting furrows or holes should be free of trash to ensure proper closure.

Roots must be planted straight down and not twisted, balled, or U-shaped. Lean will not exceed 30 degrees. See Figure 2 for more details.

Do not prune roots unless they are too long to be planted properly. If pruning is necessary, prune only enough root to properly plant the tree (but leave an unpruned length below the seedling root collar of not less than 5 inches for pines and 8 inches for hardwoods).

The soil must be packed firmly around planted seedlings with no air pockets left in machine furrows or planting holes. Properly planted seedlings should resist gentle tugging pressure.

Newly planted pine stands may be susceptible to Pales weevils if planted less than six months after a harvest (Rule of Thumb = harvested after July 1). If planted during this time frame, the roots will be dipped in an insecticide solution prior to planting or the areas immediately surrounding the newly planted seedlings will be treated. See Pest Management (Code 595) for further planning requirements.

Exclude fire from all young plantations (See Firebreak, Code 394). Exclude grazing from all

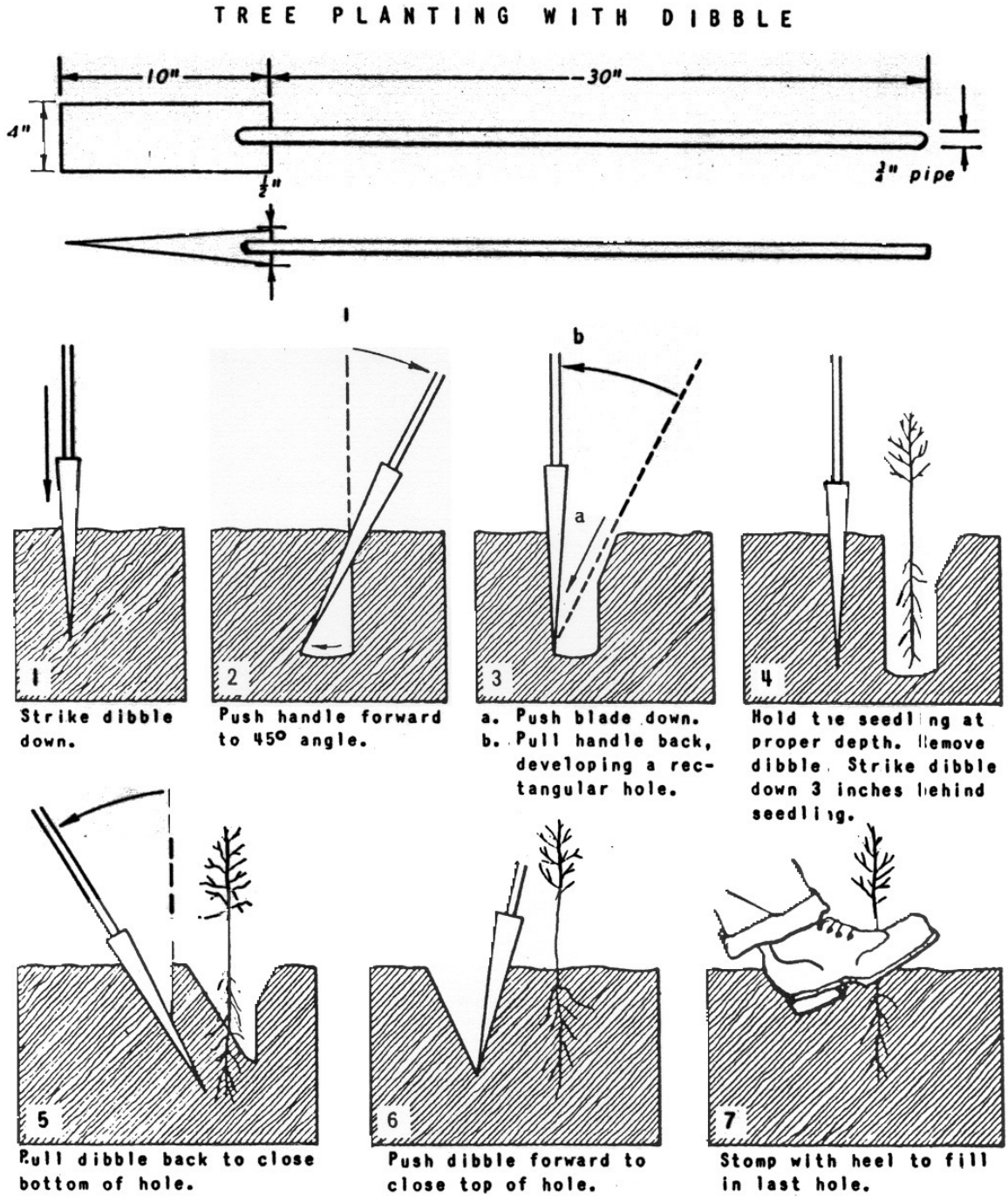
hardwood plantations and from pine plantations where the trees are shorter than six feet (See Use Exclusion, Code 472).

FIGURE 1. Soil pH Ranges* and Flooding Tolerances for Some Arkansas Tree Species

Common Name	Scientific Name	Range in pH	Flood Tolerance
Ash, Green	Fraxinus pennsylvanica	3.6-7.5	Moderately Tolerant
Baldcypress	Taxodium distichum	4.6-7.5	Tolerant
Beech, American	Fagus grandifolia	6.0-7.0	Weakly Tolerant
Birch, river	Betula nigra	4.5-6.0	Weakly Tolerant
Blackgum	Nyssa sylvatica	4.6-7.0	Intolerant
Buckeye	Aesculus species	6.0-8.0	Intolerant
Catalpa	Catalpa species	6.0-8.0	Intolerant
Cherry, black	Prunus serotina	4.6-6.2	Intolerant
Cottonwood	Populus deltoides	3.6-7.5	Weakly to Moderately
Dogwood, flowering	Cornus florida	6.0-8.0	Intolerant
Elm	Ulmus species	5.2-8.0	Intolerant - Moderately
Hickory, water	Carya aquatica	4.8-6.0	Moderately Tolerant
Holly, American	Ilex opaca	5.0-6.0	Intolerant
Honeylocust	Gleditsia triacanthos	6.0-8.0	Moderately Tolerant
Locust, black	Robinia pseudoacacia	4.5-7.5	Intolerant
Magnolia, southern	Magnolia grandiflora	5.0-6.0	Weakly Tolerant
Maple, red	Acer rubrum	4.4-7.5	Moderately Tolerant
Mulberry	Morus species	6.0-8.0	Weakly Tolerant
Oak, black	Quercus ilicifolia	4.0-5.0	Intolerant
Oak, bur	Quercus macrocarpa	6.0-6.3	Weakly Tolerant
Oak, cherrybark	Quercus pagodaefolia	4.5-6.2	Weakly Tolerant
Oak, northern red	Quercus rubra	4.5-6.0	Intolerant
Oak, Nuttall	Quercus nuttallii	3.6-6.8	Moderately Tolerant
Oak, overcup	Quercus lyrata	3.6-5.5	Moderate to Tolerant
Oak, pin	Quercus palustris	6.0-7.0	Moderately Tolerant
Oak, shumard	Quercus shumardii	4.4-7.5	Weakly Tolerant
Oak, swamp chestnut	Quercus michauxii	3.6-6.2	Weakly Tolerant
Oak, Southern red	Quercus falcata	5.0-6.0	Intolerant
Oak, water	Quercus nigra	3.6-6.3	Weakly Tolerant
Oak, white	Quercus alba	4.5-6.2	Intolerant
Oak, willow	Quercus phellos	3.6-6.3	Moderately Tolerant
Pecan	Carya illinoeinsis	4.8-7.5	Weakly Tolerant
Persimmon	Diospyros virginiana	4.4-7.0	Moderately Tolerant
Pine, loblolly	Pinus taeda	4.5-6.0	Weakly Tolerant
Pine, shortleaf	Pinus echinata	4.5-6.0	Intolerant
Plum	Prunus species	5.0-8.0	Weakly Tolerant
Red cedar, Eastern	Juniperus virginiana	6.0-7.5	Intolerant
Redbud, Eastern	Cercis canadensis	6.0-8.0	Intolerant
Sassafrass	Sassafrass albidum	4.7-7.0	Intolerant
Sugarberry	Celtis laevigata	5.0-7.0	Moderately Tolerant
Sumac, shining	Rhus copalina	4.2-7.0	Intolerant
Sweetgum	Liquidambar styraciflua	3.6-7.5	Moderately Tolerant
Tupelo, water	Nyssa aquatica	3.6-5.6	Tolerant
Walnut, black	Juglans nigra	5.0-7.5	Intolerant
Willow, black	Salix nigra	4.6-7.5	Tolerant
Yellowpoplar	Lirodendron tulipifera	4.5-7.0	Intolerant

* Adapted from Species Suitability and pH of Soils in Southern Forests, USDA Forest Service.

FIGURE 2.


TREE PLANTING WITH DIBBLE
10"
30"
4"
½"
¾" pipe
1
Strike dibble down.
2
Push handle forward to 45° angle.
b
a
3
a. Push blade down.
b. Pull handle back, developing a rectangular hole.
4
Hold the seedling at proper depth. Remove dibble. Strike dibble down 3 inches behind seedling.
5
Pull dibble back to close bottom of hole.
6
Push dibble forward to close top of hole.
7
Stomp with heel to fill in last hole.

Cuttings. Planting of hardwood cuttings will be limited to cottonwood, willow, green ash, and sycamore. Cuttings should be 18 - 20 inches long and at least 3/8 inch in diameter. Larger cuttings may be necessary for sandy or droughty sites. Cuttings should be collected during dormancy from one year growth.

Minimum site preparation treatment will consist of double disking and subsoiling in a 12 ft. by 12 ft. grid pattern. Additional treatment may also include adding nitrogen to the subsoil trench according to soil test recommendations.

Cuttings should be soaked in water 2-3 days before planting. They should also be kept cool and moist during the planting operation.

Cuttings will be handplanted under optimum moisture conditions. Avoid planting during freezing weather or in frozen soil. Plant between December 1 and March 31.

The dormant cuttings will be planted in the subsoil trenches where the grids intersect. This will yield an initial density of 302 trees per acre. Planting depth will be sufficient so that only 2-4 inches of the cuttings are aboveground. Cuttings will be planted vertically with the buds pointing upward.

Soil should be packed firmly around cuttings with no air pockets remaining in the planting holes.

Cultivation or competition control is necessary for establishment of cottonwoods. This may vary from mowing or disking between rows to chemical application in a band along planted rows immediately after planting. Any application of chemicals used must be labeled for forestry use. See Pest Management (Code 595) for further planning requirements.

Cottonwoods may be planted with oaks in a nursecrop system to increase oak survival and growth. The oaks will be interplanted among the cottonwoods after two years (or whenever cultivation of the cottonwoods is no longer necessary) on a 12 ft. by 24 ft. spacing yielding approximately 150 stems per acre of oaks.

The cottonwoods in the nursecrop system will be cut during the dormant season at age ten and allowed to coppice. The final harvest will occur during the growing season at age 20 to allow the oaks along with natural volunteer species to comprise the forest stand composition.

Direct Seeding. Both pine and hardwood stands can be established by planting seeds. Direct seeding of light-seeded hardwoods is generally not recommended. Most efforts to do so have failed due to depredation by birds and rodents and drought stress shortly after germination.

Seeds will be carefully hand-collected or obtained from a reputable dealer for direct seeding purposes.

Ripe acorns may be collected from October to December. White oak acorns should be collected soon after they have fallen to retard early germination. Do not keep freshly collected seeds in plastic or other containers providing low aeration.

Acorn viability can be tested by floating in water for 16-24 hours. Stir the acorns once or twice during the floating period. Unsound acorns float and will be discarded (except overcup oak acorns which generally float as a dispersal method).

Acorns of the white oak group have little or no dormancy and will germinate almost immediately after falling. Acorns of the red oak group do exhibit embryo dormancy and will germinate the following spring after fall sowing. If sown in the spring, the red oak acorns require a pre-treatment consisting of 30-90 days at 33-41 degrees F. Do not freeze.

Acorns of the white oaks should not be stored if storage can be avoided, but red oak acorns can be stored up to 3 years. Viability is decreased under longer storage time. Adequate moisture

content of the acorns is critical during the storage period.

Oak acorns and pecan nuts will be planted from October 31 to April 1. The best germination results are generally achieved for December plantings.

The acorns will be machine or hand planted at a spacing of 10X3 feet or 12X2.5 feet (1,250 to 1,500 seeds per acre). Depth of planting will be 1 to 2 inches.

Approximate pounds of seed per acre required for various oak and pecan species are as follows:

Common Name	Group	Lbs./Acre
Cherrybark oak	Red	3-4
Cow Oak	White	20-25
Hickory species	-	8-20
Laurel oak	Red	3-4
Nuttall oak	Red	12-15
Overcup oak	White	8-10
Pin oak	Red	4-5
Sawtooth oak	White	10
Shumard oak	Red	12-15
Southern red oak	Red	3-4
Sweet Pecan	-	10-12
Water oak	Red	4-5
Willow oak	Red	3-4
White oak	White	12-15

Pine seeds may be aerially sown or distributed by hand from February 15 to April 15. Hand sowing can include use of a "cyclone" type seeder.

Spot seeding of pine seed is an alternative to broadcast sowing on small tracts. It requires no special equipment and uses one-third to one-half the seed used in broadcast seeding. Clear an area approximately one-foot square with a rake or hoe, drop 3-6 seeds per spot, and lightly press the seed into the soil. About 1000 spots per acre (spaced 6'X7', 5'X8', or 4'X10') are needed to have adequate stocking.

Seeding rates for pines will be as indicated below:

Common Name	Seed Per Pound	Lbs /Acre Broad-cast	Lbs/Acre for 1000 Spots
Loblolly	18,500	1.0	1/3
Shortleaf	45,000	½	¼

Natural Regeneration. The use of a natural seed source may be used under any of the following circumstances:

- Sufficient seed trees and/or shrubs of the desired species and size are available to meet reasonable expectations for natural regeneration.
- Sites for potential natural regeneration are within 200 feet of existing seed sources.
- Sites are generally too wet or flooded during the planting season to facilitate proper tree planting procedures or make planting unlikely to succeed.
- Sites are likely to be invaded by soft mast hardwood species which will out-compete planted hard mast species.
- Sufficient advance hardwood reproduction is present at the time of timber harvest. Do not base evaluation on expected stump and root sprouts.

Some site preparation may be necessary to promote natural regeneration (See Forest Site Preparation, Code 490).

Three harvest types can be used to naturally regenerate pine (See Forest Stand Improvement, Code 666):

- Seed tree
- Shelterwood
- Clearcut

The clearcut method depends upon using trees within 400 feet of the clearcut area for the seed source. The clearcut will be oriented perpendicular to prevailing winds.

Only light-seeded hardwoods (such as green ash, sweetgum, maple, sycamore, elm, cottonwood, and willow) will benefit from the

seed tree method. Generally oaks are regenerated through advance reproduction at the time of harvest.

Seeds of species such as overcup oak, water hickory, baldcypress, and tupelo gum will be dispersed by floatation in floodwaters. Scope of dispersal depends upon the extent of backwater flooding.